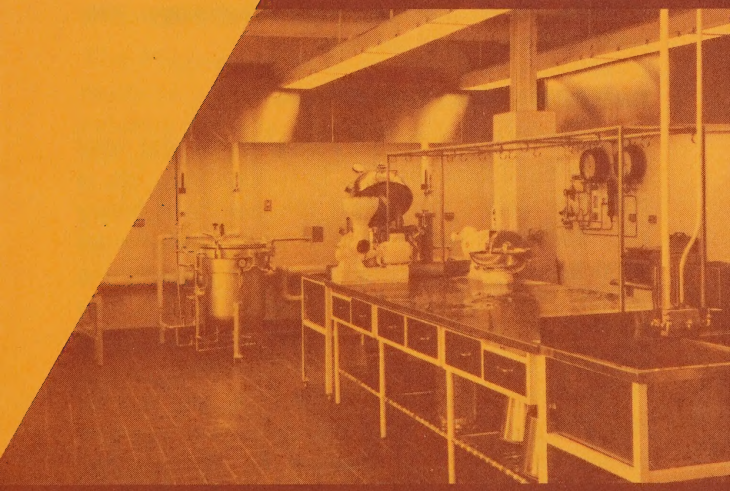
FOOD RESEARCH INSTITUTE

Open House



MAY 12 – 16, 1965 — 2 PM – 10 PM

FOOD RESEARCH INSTITUTE

The Food Research Institute was established in April, 1962, by amalgamating the Dairy Technology Research Institute, the food processing and storage laboratories of the Plant Research Institute and the lipid laboratory of the Genetics and Plant Breeding Institute. Since then, several of these laboratories have been enlarged and new ones have been added.

Through its research on food composition and quality, the Institute helps solve many Canadian and international food problems. Studies are carried out on carbohydrates, fats and proteins; the growth and metabolism of microorganisms; and the effects of storage on fruits and vegetables. New foods and food processes are developed from Canadian agricultural raw materials, with quality being one of the main considerations. In general, the research undertaken supplements that done by industry.

Many studies are carried out by teams of scientists having various specializations, to give a well-rounded approach to a problem. However, for administrative purposes, the Food Research Institute is divided into seven sections—carbohydrate, dairy, lipid (fats), microbiology, processing, protein and storage.

CARBOHYDRATE SECTION

Research on the carbohydrates of honey and royal jelly is conducted by Dr. I. R. Siddiqui. He is studying factors that affect the quality of honey and, because royal jelly is of such fundamental importance to bee-keeping, is also examining certain chemical aspects of royal jelly. The material that keeps certain honeys from clarifying has been isolated, purified and identified.

The carbohydrate material in royal jelly is complex and appears to have nitrogenous substances associated with it. For example, Dr. Siddiqui has shown that a component thought to be ribóse, a type of sugar, is not ribose at all but a combination of substances in which several sugars have been detected. Similarly, he has found that another

material in royal jelly is not a carbohydrate but a sugar-containing protein of low molecular weight.

Dr. S. Haq is studying the carbohydrate components of the cells and cell walls of fruits and vegetables to determine their roles in the texture of fresh and processed foods. For example, potatoes with high solids content are valued but the true significance of potato solids is not yet known.

DAIRY SECTION

Processes in the manufacture and handling of milk and dairy products are being studied in the Dairy Section so that the chemical and physical reactions involved can be better understood. Drs. D. B. Emmons and V. R. Harwalkar are studying the properties, interactions and the mechanisms of coagulation of milk proteins that form the curd in cheese.

Because useful bacteria must be present in cheesemaking, the properties of these organisms and their growth and survival in hot and cold environments are being studied by C. A. Gibson to determine the best method of storing and transporting cheese starter cultures. Dr. Emmons is endeavoring to clarify how these starter cultures and other bacteria affect the development of curd and flavor in cheddar and cottage cheeses. In earlier experiments by G. B. Landerkin, now of the Microbiology Section, cut and wrapped cheddar cheese exposed to gamma radiation kept 30 times longer than untreated cheese.

The flavor of cheddar cheese is being studied from the chemical view-point by Dr. W. A. McGugan. Cheddar flavor components are isolated, identified and tested alone and in combination with others by a panel of expert tasters. This information is subsequently used by microbiologists studying likely bacteria to determine which strain produces the desired flavor component.

LIPID SECTION

The Lipid Section is concerned mainly with vegetable oils and the lipids in cereals, vegetables and

fruits. Drs. R. P. A. Sims, Mary McKillican and Marius Lepage are studying the development of new foods of plant origin through genetic manipulation, and the role of lipids in animal and vegetable tissue and in processed foods.

The amount of polyunsaturation in an oil, which determines susceptibility to rancidity, is fairly easy to control genetically. Through cooperative studies with geneticists, oils of varying degrees of unsaturation have been produced by plant breeding. A series of investigations of the lipid changes in maturing oil-bearing plants—flax, safflower and rape—has provided background information for the current biochemical study of how unsaturated fatty acids are formed.

As flours from different varieties of wheat differ markedly in baking quality, a thorough study of wheat lipids was made to determine their relation to gluten strength; several new lipids were discovered. The pigments in flour from macaroni- and bread-type wheats are being examined to determine why the former is more highly pigmented; differences in both amount and type of color body have been found.

In an integrated study of potato quality, the lipids of three potato varieties grown under the same conditions are being examined, as well as lipid changes during early and late storage.

The highly developed skill used in these analyses is now being applied to determine how lipid and protein are associated in the plant cell; to answer the very basic question of how an oil seed, containing up to 50 percent oil, holds lipid inside its cells; and to shed further light on the nature of potato quality. The components of various types of cells are being separated by Dr. F. B. Johnston and the lipid associated with each component is being identified.

MICROBIOLOGY SECTION

Both helpful and harmful microorganisms are under study in the Microbiology Section. The lactobacilli, so important in the dairy and fermentation industries, are being classified by Dr. J. A. Elliott to study specific functions of well-

identified strains. Because the metabolic products of microorganisms and the reactions of certain of their enzyme systems play an important role in the quality and flavor of foods, the metabolism and growth of selected microorganisms are being investigated. For example, Dr. E. W. Seitz is studying the Group N streptococci and A. R. Yates is studying an unusual mold species of the genus *Byssochlamys*.

Molds and yeasts affect the stability of stored, pickled or preserved fruits and vegetables. Through a study of the growth of these organisms, the effectiveness of chemical fungicides in protecting stored fruit has been appraised. Gamma radiation has been used successfully to greatly improve the resistance of fruit to fungus rots without changing its normal rate of ripening. W. E. Ferguson, who is responsible for this research on fruits and vegetables, is now studying the development of pectin-destroying enzymes in fungi. G. B. Landerkin is making similar studies of food spoilage and the organisms causing it in dairy products and other animal products. As a necessary first step, he has markedly improved the techniques for plating (growing) and counting staphylococci.

PROCESSING SECTION

The Processing Section develops processing methods and equipment for the Canadian food industry and new food products for domestic and foreign markets. Product and process development is the concern of Dr. N. W. Tape, the Section Head, and Dr. E. A. M. Asselbergs, A. C. Nunes, and M. E. Larmond.

Dr. Asselbergs' earlier work on the application of infrared radiation to food processing is being extended and another part of the spectrum, the microwave region, is being explored. The range of instant products prepared by drum-drying has also been extended and a more complete understanding of the instant-potato process achieved. For example, through the use of a machine that measures viscosity of starch, Dr. Tape has been able to show clearly differences between instant potatoes prepared according to different patents

and to develop a simple method of quality control. With the acquisition of new equipment, a comparison of various drying methods can now be made; for example, the behavior of fruits can be compared during tray-drying, fluidized bed-drying and freeze-drying.

The effects of processing on food quality are measured by physical and chemical methods in the laboratory, where A. C. Nunes is in charge, and are assessed in taste panels in the test kitchen. A reliable indication of food quality can now be given.

Mrs. M. E. Larmond conducts acceptance taste panels to evaluate storage life, recipes and processes; and analytical panels at which trained tasters detect small differences in quality. She also studies ingredient compatibility and develops recipes for experimental foods.

Recently, a food processing engineer, Gordon Timbers, was added to the staff of the Engineering Research Service. He advises the staff of the Processing Section and other members of the Institute on equipment design and operation, instrumentation and costing.

PROTEIN SECTION

This section was formed early in 1965. Dr. J. Quinn is establishing a research program to study animal and plant proteins. Here, as in our other areas of research, information on the nature of quality will be fed back to geneticists and the food industry. Initial research is on the red meat pigment, myoglobin, and on enzymes that degrade proteins.

STORAGE SECTION

The Storage Section is studying how external factors affect the storage life of fruits and vegetables and how the chemical composition of plant tissues affects their quality and behavior in storage. Two chemists, Dr. F. B. Johnston, Head of the Section, and A. B. Durkee, examine selected fruits and vegetables for chemical and enzymic composition. Dr. Johnston is mainly interested in the role that nonvolatile organic acids and sugars

play in the flavor and storage life of fruits. A. B. Durkee is isolating from the core, seeds and cortex of fruits substances that promote or inhibit their metabolism during storage. P. A. Poapst uses plant physiology techniques to investigate the activities of these potent substances and their distribution in the tissues, seeking possible relationships with storage behavior.

W. R. Phillips is studying the development of "core flush" in stored McIntosh apples. The effects of tissue components, cultural and storage conditions, and gamma radiation on storage life are being investigated so that control measures can be improved. Cortland apples, a variety susceptible to scald, are also being used to find out how gas storage affects scald development. In addition, for the Farm Building Plan Service, W. R. Phillips is rewriting a booklet on storage buildings for fruits and vegetables.

Storage tests are conducted in cooperation with Atomic Energy of Canada Limited. Experiments using their gamma radiation facilities have shown that the incidence of core flush in apples can be controlled by moderate doses of radiation.

FOOD RESEARCH TRAINING PROGRAM

An additional activity, not anticipated when the Institute was formed, is the training of senior technicians and food scientists for the Canadian Food Industry. In each section of the Food Research Institute, specialized techniques have been invented or developed; advantage of these skills has been taken by a cross-section of the food industry, for whom travel costs and maintenance of the employee being trained in Ottawa are the only expenses involved. The Institute also benefits by learning at first hand the major research problems facing the food industry. Also, as a result of the training, industrial troubleshooting usually can be done independently at the plant.

Training is also provided to foreign students who come to the Institute directly or, if enrolled at Canadian universities, spend the summer here.

ROGER DUHAMEL, F.R.S.C.
Queen's Printer and Controller of Stationery
Ottawa, 1965